

In the Specification:

Please insert a new heading at page 1, above existing line 1, as follows:

TITLE OF THE INVENTION

Please insert a new heading at page 1, above existing line 2, as follows:

FIELD OF THE INVENTION

Please amend the paragraph at page 1, lines 2 to 4, as follows:

C1
The invention relates to an arrangement of a heating layer for a high-temperature gas sensor, especially for sensing a gas or gas mixture at high temperatures. ~~according to the preamble of the claim 1.~~

Please insert a new heading at page 1, above existing line 5, as follows:

BACKGROUND INFORMATION

Please amend the paragraph at page 1, lines 5 to 13, as follows:

C2
Sensors that are used in the exhaust gas of a combustion engine must not only be high-temperature stable, but rather they must typically also be regulated to maintain a determined operating temperature, because both the temperature of the exhaust gas as well as the exhaust gas throughput are dependent on the operating state of the engine and vary strongly. ~~Typically such~~ Such sensors are

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C2
end

operated at several hundred degrees Celsius. A typical example ~~therefor~~ is the λ -sonde which can be operated at temperatures up to 1000°C.

Please amend the paragraph at page 1, line 14 to page 2, line 20, as follows:

C3

New Other types of planar exhaust gas sensors, which are presently being produced by various manufacturers, consist of a structure as is shown in Fig. 1a, 1b and 1c in various perspectives. In this context, Fig. 1a shows the top side of the sensor as a plan view, Fig. 1b shows the sensor in a side view on the section location marked with a dashed line, and Fig. 1c shows the bottom side of the sensor in a plan view. For orientation, a coordinate system with an x-, y- and z-axis is drawn in. The Figures show an elongated rectangular carrier 1, also called a transducer, which generally consists of an electrically insulating substrate, ~~and on the underside 5 of which, a~~ A heating layer 8 is applied to the underside 5 as shown in Fig- Figs. 1b and 1c. This heating layer 8 comprises a heating conductor path 6 and a supply line part 2. The heating conductor path 6 is located on the sensor bottom side under the functional layer 4, which is arranged on the sensor top side 7. The functional layer 4 determines the special characteristics of the sensor, such as, ~~for example,~~ the selectivity for a certain gas or the like. Then, an electrode structure 3 adapted to the special requirements of a gas sensor is applied on the sensor top side 7 under

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(3) end
the functional layer 4. A temperature that is constant over the location must prevail on the sensor tip 10 on the sensor top side 7, in the area in which the functional layer 4 is applied. This constant temperature is achieved with the aid of the heating layer 8 and a temperature sensor or feeler, which is not shown in this illustration and but is located on the sensor bottom side. Thereby the functional layer 4 is regulated to a determined temperature, the so-called operating temperature.

Please amend the paragraph at page 3, line 20 to page 4, line 2, as follows:

(4)
In the U. S. 5,430,428, DE 43 24 659 C1 and DE 198 30 709, similarly, forms for the extending path or progression of the heating conductor path in an exhaust gas sensor are disclosed. In this context, the heating conductor path is arranged in a meandering shape. ~~In this context, however,~~ However, the uniformly modulating meander band is arranged rectangularly and also runs parallel to the y-axis of the sensor.

Please amend the paragraph at page 5, lines 11 to 21, as follows:

(5)
In order to make the temperature distribution on the sensor top side more homogeneous, it is suggested in the EP 0,477,394 to build up or construct the heating conductor paths on the sensor tip in the form of a ladder, whereby the ladder pattern contains a plurality of parallel circuit-connected individual conductors, which can be

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arranged in ~~such a manner~~ so that a homogeneous temperature distribution can be adjustably set over the length. In this context, both the width or the cross-section of the various heating conductor paths as well as the spacing between two heating conductor paths, which represent the spokes of the ladder formation, can vary.

Please insert a new heading at page 7 above existing line 17. as follows:

SUMMARY OF THE INVENTION

Please amend the paragraph at page 7, lines 17 to 23, as follows:

Cb

It is the object of the invention to arrange the heating conductor path(s) in ~~such a manner~~ so that the same temperature prevails at each location of the functional surface layer of the sensor. It is a further object of the invention to provide a fundamental basis with which an exact temperature determination, and connected therewith, an exact temperature regulation or control on the functional surface, is made possible.

Please amend the paragraph at page 7, line 24 to page 8, line 5, as follows:

C7

This object is achieved according to the invention by ~~the features in the patent claim 1:~~ a gas sensor for sensing a gas or gas composition at high temperatures, said gas sensor comprising a substrate having a sensor carrier section with a tip and a conductor carrier section

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C7
end

connected to said sensor carrier section opposite said tip,
a gas sensor function layer supported by said sensor
carrier section of said substrate next to said tip, an
electrical heater supported by said sensor carrier section
in a position for heating said gas sensor function layer,
electrical conductors supported on said conductor carrier
section of said substrate and electrically connected to
said electrical heater, said electrical heater comprising
heater sections having different heating resistance values
which depend on a spacing between any particular heater
section and said tip of said sensor carrier section for
generating a constant operating temperature throughout said
gas sensor function layer by compensating varying heat
dissipations by said substrate in said sensor carrier
section. In this context, the meander-shaped heating
conductor path comprises different partial heating resist-
ances in different partial sections with reference to the
x-axis. The height or magnitude of the partial heating
resistance is dependent on the spacing distance relative to
the sensor tip.

Please insert a new heading at **page 9** above existing line 7, as follows:

BRIEF DESCRIPTION OF THE DRAWINGS

Please amend the paragraph at **page 9**, lines 18 to 20, as follows:

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CS
Fig. 2b shows the temperature distribution for a high-temperature gas sensor with the heating layer shown in Fig. 2b 2a.

Please insert a new heading at page 11 above existing line 10.
as follows:

CA
DETAILED DESCRIPTION OF PREFERRED EXAMPLE EMBODIMENTS AND
OF THE BEST MODE OF THE INVENTION

Please amend the paragraph at page 11, line 10 to page 12, line 7, as follows:

C10
Fig. 4a shows a heating layer arrangement with a heating conductor path 6, of which the extending path or progression forms a meander-band, which, beginning on the supply line part 2, first extends modulatingly on the one side parallel to the x-axis, and then extends in a straight line along the sensor tip parallel to the y-axis, and then again extends on the other side modulatingly parallel to the x-axis back to the supply line part 2. In this context, the heating layer 8 was produced with a platinum thick film paste, which was applied by a screen printing technique onto an aluminum oxide substrate and thereafter was fired. For achieving a homogeneous temperature profile, the partial heating resistance in the x-direction was varied. The partial heating resistance is proportional to the quotient of the path length l and the width of the heating conductor path b relative to a path distance in the x-direction.

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In order to adapt the heating resistance to the desired temperature profile, that is to say the same or constant temperatures over the entire functional layer, 4 in the example embodiment, the path length 1 of the heating conductor path 6 is shortened from partial section to partial section, in that the height or amplitudes of the meander-band 11 is steadily constantly reduced from section to section. It would also be exactly as effective to reduce the modulation rate, namely the frequency of the direction change of the meander-band 11, with reference to a path distance in the x-direction.

Please amend the paragraph at page 12, lines 8 to 13, as follows:

C11

The relationship between the path length 1 of the heating conductor path 6 and the proportion of the path distance covered or traversed in the x-direction is important. Thereby, the partial heating resistance per unit length in the x-direction can be varied. Thus, different energy quantities can be supplied to the functional layer at different locations.

Please amend the paragraph at page 12, line 14 to page 13, line 3, as follows:

C12

In this application example, a constant heating conductor path width b of $b \approx 300 \mu\text{m}$ was selected. It is also evident in this illustration, that the area or region in which the heating conductor path 6 is applied, is substantially longer than the length L of the functional

C12
END

layer ~~lying thereover~~ 4 which lies over the path 6. The heating conductor path 6 ~~arranged in~~ has a meander-shape, ~~which and~~ is arranged between the outer or tip end of the functional layer 4 lying thereover and the supply line part 27. The path 6 is positioned to heat the gas sensor function layer 4. More specifically, the heater path 6 serves to compensate and to provide counter heating for the heat flow and dissipation to the sensor connection side 9. In order to achieve this, compensation most of the heating power, heat energy, that is to say the greatest proportion on along the entire length of the heating conductor path 6 is required. The high resistance value per unit length in the x-direction is achieved by the long winding path shape of the heating conductor path 6. Which resistance value is required at which location can either be calculated or determined by experiments.

Please insert a new paragraph at page 18 following existing line 24, as follows:

C13

Although the invention has been described with reference to specific example embodiments, it will be appreciated that it is intended to cover all modifications and equivalents within the scope of the appended claims. It should also be understood that the present disclosure includes all possible combinations of any individual features recited in any of the appended claims.